

Subject: INFORMATION: Guidance for Demonstrating
Compliance with Seat Dynamic Testing Deceleration
Pulse Shapes

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From: Manager, Transport Airplane Directorate, Aircraft
Certification Service, ANM-100

Reply to 97-112-43
Attn. of:

To: SEE DISTRIBUTION

The purpose of this memorandum is to provide additional guidance on acceptable pulse shapes to demonstrate compliance with § 25.562 of the FAR. Criteria for determining the acceptability of pulse shapes is given in paragraph 13.b, Impact Pulse Shape, and Appendix 1 of Advisory Circular (AC) 25.562-1A. This memo is intended to re-emphasize the intent of the guidance in the AC and promote greater standardization and equal treatment among applicants.

Appendix 1 of the AC gives a detailed procedure for establishing the acceptability of a test pulse once certain criteria are met. These criteria include maximum peak g, rise time and total velocity change. The fundamental criteria for the ideal test pulse is first, that it meets the minimum regulatory requirements and second, that it approximate an isosceles triangle. The intent of Appendix 1 was to provide a means to assess triangular pulses that deviated from the ideal. It is now apparent that the requirement that the pulse be "triangular" needs to be reemphasized and the current graphical evaluation procedure is insufficiently defined to ensure an acceptable test pulse.

Recently, we have seen test pulses that, while they may satisfy the graphical evaluation procedural methods in Appendix 1 of the AC, do not resemble an isosceles triangle. An example of such a pulse is attached for information. Taken to its extreme, a pulse with an instantaneous peak g of the correct value, followed by a rectangular pulse of the specified duration at one half the peak value would satisfy the graphical procedure in the Appendix. Clearly, this type of pulse is not triangular, would impart a much less severe load on the seat, and would not meet the intent or the minimum requirements of the regulation.

In order to ensure that the minimum regulatory requirements are satisfied and an adequately triangular pulse shape has been obtained, Step "6" of Appendix 1 should be modified as follows:

"6. Construct a line parallel to the ideal (minimum regulatory requirement) pulse and offset by 2 g in magnitude less than the ideal during the time interval between T₁ and T₃. Likewise construct a line parallel to the ideal pulse and offset by 2 g in magnitude less than the ideal (minimum regulatory requirement) pulse on the trailing side of the pulse from:

$$T_3 < t < T_1 + 1.33(T_3 - T_1)$$

If the magnitude of the acquired pulse is 2 g less than the ideal pulse shape at any point along the acquired pulse shape during the period $T_1 < t < T_1 + 1.33(T_3 - T_1)$, the pulse is unacceptable.

As an example, the 16 g test specified for Test 2 in § 25.562 of the FAR has rise time, (T₃-T₁), of 90 milliseconds. For a test pulse to be in compliance with the 16 g test pulse, the magnitude of the acquired pulse can be no less than 2 g from the ideal pulse during the time interval from $T_1 < t < (T_1 + 120)$ milliseconds. The acquired pulse shown in Figure 5 is unacceptable because the acquired pulse magnitude

is more than 2 g below the tolerance band during the onset period. (Note that, because deceleration is expressed as a negative number, the graph below is inverted, with magnitude increasing in the downward direction from the reference.

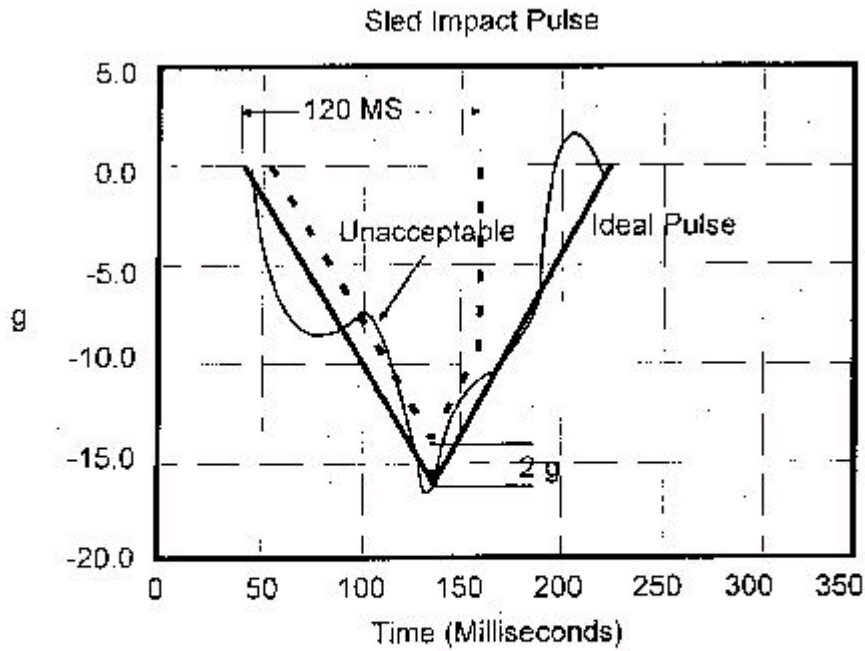


Figure 5

The above procedure should be applied to verify the acceptability of acquired test pulses submitted to show compliance with the test conditions prescribed in § 25.562. For a test pulse to be in compliance with the 14 g test prescribed in Test 1 of § 25.562, the magnitude of the acquired pulse can be no less than 2 g from the ideal pulse during the time interval from

$T_1 < t < (T_1 + 107)$ milliseconds."

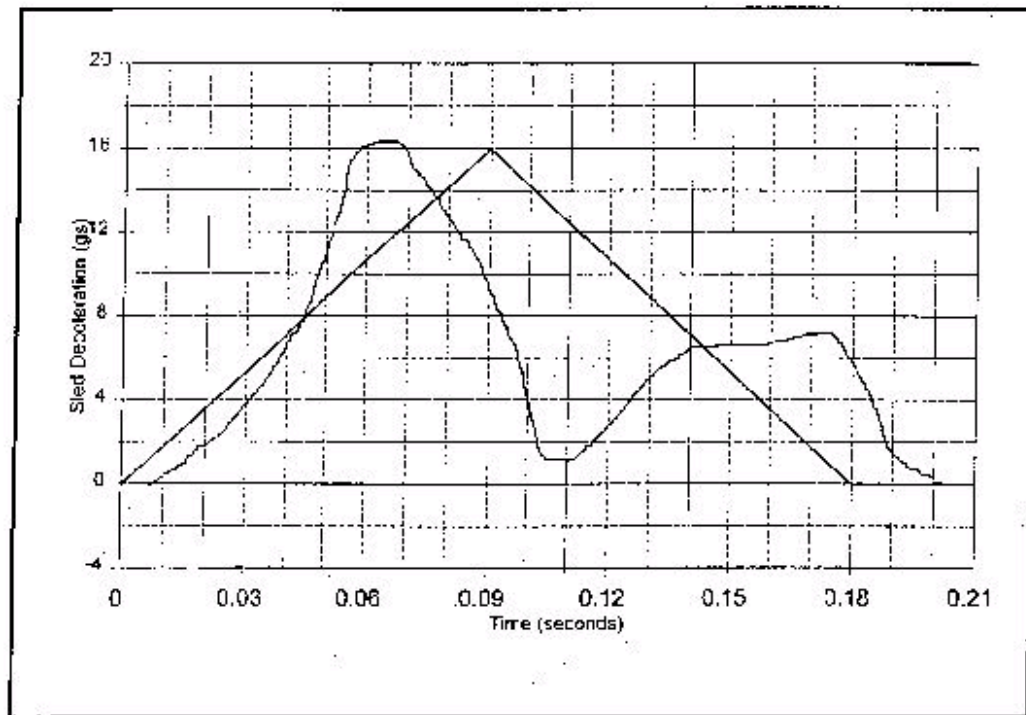
Seat certification programs that have already been conducted with deceleration pulses that differ significantly from the above criteria need not be repeated, although it is recommended that design changes that may result from a return to the regulatory minimum pulse be embodied on any such programs, to the extent that they can be. Any future tests should be evaluated using the procedure outlined above.

Any questions may be directed to Jeff Gardlin at (425)227-2136.

**ORIGINAL SIGNED BY
STEWART R. MILLER**

Ronald T. Wojnar

Attachment



Attachment to Memorandum

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